

DOCKET NO: 40-8778

LICENSE NO: SMB-1393

LICENSEE: MOLYCORP, INCORPORATED, WASHINGTON, PA.

SUBJECT: SAFETY EVALUATION REPORT, LICENSE AMENDMENT REQUEST
DATED JULY 1995, CONCERNING THE DECOMMISSIONING OF
MOLYCORP WASHINGTON, PENNSYLVANIA METAL ALLOY
PROCESSING FACILITY

1.0 INTRODUCTION

Between 1964 and 1970, the MolyCorp Washington facility produced a ferro-columbium alloy from a Brazilian ore (pyrochlore). This ore contained thorium and uranium as accessory metals, however, these radioactive metals were present in quantities sufficient to require MolyCorp (the licensee) to obtain a radioactive materials license. The first radioactive materials license for the Washington site was issued on December 19, 1963. The current Washington facility license, SMB-1393, was issued on September 1, 1992, and is under timely renewal. Wastes from the ferro-columbium operation have been present on the site in the form of thorium and uranium bearing slag since 1974. Some of the slag was used as fill material over various portions of the site. In addition, a large portion of slag is located in a stabilized, soil-capped pile on the southern portion of the site. No record exists which describes the location of slag fill material on the site. In preparation for cleanup of the site, the licensee submitted its initial decommissioning plan (DP) to the U.S. Nuclear Regulatory Commission (NRC) in July 1995 (Reference a). The DP has been supplemented twice: (a) first on June 30, 1999, (DP Part 1) to reflect the licensee's intent to decommission a portion of the site using interim cleanup criteria contained in NRC's "Action Plan to Ensure Timely Cleanup of Site Decommissioning Management Plan Sites" (SDMP Action Plan) (57 FR 13389, Reference b) and; (b) on July 14, 2000 (DP Part 2) for that portion of the site intended to meet the requirements of the New License Termination Rule (LTR) in 10 CFR Part 20 Subpart E, "Radiological Criteria for License Termination," published in July of 1997. This safety evaluation report (SER) addresses only the Part 1 decommissioning. Part 2 will be the subject of a separate evaluation.

NRC has prepared an environmental assessment (EA) (Reference c) in conjunction with this SER.

1.1 Purpose

The purpose of this SER is to evaluate the licensee's proposed request to remediate a portion of the site to meet the SDMP Action Plan criteria for unrestricted release, to assess whether unrestricted release criteria will be met, and whether decommissioning activities will be conducted in a safe manner in accordance with NRC regulations. This safety evaluation has been developed in conjunction with an EA which evaluates the potential environmental impacts associated with this action. If this action is approved, the licensee would remediate those portions of the Washington site currently contaminated with radioactive material using the methods and cleanup criteria proposed in the July 1995, "Decommissioning Plan for the Washington, PA Facility," (Reference a) as supplemented by the June 30, 1999, revision (Reference d).

1.2 Description Of Proposed Action

The licensee's DP proposes criteria and methods to cleanup residual contamination in soils, groundwater, and structures on the Washington site. If this action is approved, it would authorize the licensee to conduct such remediation activities. This action does not assess the final disposition of waste from the Washington site but approves the decommissioning activities necessary to assure that the currently contaminated portion of the site will meet NRC cleanup criteria. However, if DP Part 1 is approved, the licensee will be required to dispose of waste from Washington at an NRC-approved disposal or storage site. Although off site disposal at a licensed low-level waste disposal facility would be authorized, on site disposal will require a separate evaluation which is not included within this SER.

The following decommissioning activities are identified in the Part 1 of the DP.

- Identify the location, depth and thickness of areas containing greater than 10 pCi/g total thorium using the gamma-log data from the site characterization report (Reference e). These areas are summarized in Table 2-1 and displayed in Figure 2-2a of DP Part 1 and further discussed in the letter to L. Camper (NRC) from G. Dawes (Molycorp), dated April 3, 2000 (Reference f).
- Mobilize equipment, set up decontamination facilities, and implement erosion control measures in preparation for excavation activities
- Survey the site area to establish spatial coordinates of contaminated areas identified from site characterization radiological surveys
- Excavate all soil and slag containing average contamination levels in excess of the unrestricted use criteria approved by the SDMP Action Plan.
- Stockpile excavated material in preparation for loading onto transports. Stockpiling duration is estimated at 2 weeks. Erosion controls include: high-density polyethylene or very low density polyethylene liners, fugitive dust control by water spray or other suppressants, cover for stockpiles existing longer than 2 weeks, and routine air and surface water samples near stockpiles
- Sample excavated material to be transported consistent with requirements of the NRC - approved disposal location
- Transport the material containing average contamination levels in excess of the unrestricted release criteria to an NRC-approved location. Loading and transport will occur during excavation activities to limit the amount of time contaminated material is stockpiled
- Conduct final survey to demonstrate compliance with the cleanup criteria. A final survey plan will be submitted to NRC for review and approval prior to the start of decommissioning activities.
- Survey the stockpiled clean overburden using a sample density of 1/25 cubic meters to confirm the soil meets the unrestricted release criteria.

- Backfill excavated areas that meet the unrestricted release criteria with the clean overburden

1.3 Radiological Release Criteria

1.3.1 Surface Contamination Release Criteria

The principal radiological constituents identified during site characterization are Th-232, U238, and their daughter products. The licensee has proposed to remediate any surface contamination (on equipment and structures) within the NRC limits specified for unrestricted release. The criteria in Table 1.3, below, have previously been approved by NRC for unrestricted release (Reference b).

Table 1.3 Acceptable surface contamination levels

Nuclides ^a	Average ^{b,c,f}	Maximum ^{b,d,f}	Removable ^{b,e,f}
U-nat, U-235, U-238, and associated decay products	5,000 α dpm/100 cm ² (83.33 Bq/100 cm ²)	15,000α dpm/100cm ² (250.0 Bq/100 cm ²)	1,000 α dpm/100 cm ² (16.67 Bq/100 cm ²)
Transuranics, Ra-226, Ra-228, Th-230, Th-118, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm ² (1.667 Bq/100 cm ²)	300 dpm/100 cm ² (5.00 Bq/100 cm ²)	20 dpm/100 cm ² (0.333 Bq/100 cm ²)
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm ² (16.67 Bq/100 cm ²)	3,000 dpm/100 cm ² (50.0 Bq/100 cm ²)	200 dpm/100 cm ² (3.333 Bq/100 cm ²)
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90, and others noted above	5,000 dpm/100 cm ² (83.33 Bq/100 cm ²)	15,000 dpm/100 cm ² (250.0 Bq/100 cm ²)	1,000 dpm/100 cm ² (16.67 Bq/100 cm ²)

^aWhere surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

^bAs used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate factor for background, efficiency, and geometric factors associated with the instrumentation.

^cMeasurements of average contamination should not be averaged over more than 1 m². For objects of less surface area, the average should be derived for each such object.

^dThe maximum contamination level applies to an area of not more than 100 cm².

^eThe amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

^fThe average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 mg/cm² of total absorber.

When surface contamination results from a mixture of radionuclides, and gross alpha measurements are used, the licensee will use the most restrictive limit from Table 1.3. Survey methods will be conducted in accordance with NUREG/CR-5849 (Reference g).

1.3.2 Soil Release Criteria

The soil release criteria proposed by Molycorp in Table 1.3A, below, have been previously approved for unrestricted release of uranium and thorium contaminated sites. A final site survey will be conducted following completion of cleanup activities to demonstrate compliance with the unrestricted release limits in Table 1.3A. The Washington site contains a mixture of both thorium and uranium contaminated soils and the release limits in Table 1.3A will be applied using the sum-of-ratios rule described in footnote 1 of the table.

Table 1.3A
Soil release criteria¹

Radionuclide	Maximum Soil Concentration	Reference
Natural Thorium (Th-232 plus Th-228) if all daughters are present and in equilibrium	10 pCi/g (0.37 Bq/g)	(57 <u>Federal Register</u> 13389)
Natural Uranium Ores (U-238 plus U-234) if all daughters are present and in equilibrium	10 pCi/g (0.37 Bq/g)	(57 <u>Federal Register</u> 13389)

¹If only one radionuclide is present, the maximum concentration is the value listed in this table. If more than one radionuclide is present, however, the ratio between the measured concentration and the corresponding limit listed in this table is determined. The sum of such ratios for all radionuclides present must not exceed one.

Formulation of the specific approach for final survey and compliance with the sum-of-ratios rule will be dependent on the results of ongoing analyses to determine the relative concentrations of uranium and thorium in soils and the equilibrium status of daughter products. The licensee will submit to NRC for review and approval a final survey plan prior to excavation of contaminated soils. The final survey plan must describe the details of survey methods, instrumentation, and analysis methods in addition to site specific data to support conclusions regarding the equilibrium status of daughter products and the approach to compliance with the sum-of-ratios rule. NRC staff will review the final survey plan to determine whether sufficient information exists about the radiological status of the site to allow NRC to determine with confidence that the survey will demonstrate that the licensee has complied with the unrestricted release criteria.

2.0 DESCRIPTION/OPERATING HISTORY OF WASHINGTON FACILITY

The Molycorp, Inc. Washington site is a metals processing facility located in southwest Pennsylvania in Washington County approximately 56 km (35 mi) southwest of Pittsburgh. The address is 300 Caldwell Avenue, Washington, Pennsylvania, 15301.

The operating history of the plant began with ferroalloy manufacturing operations (e.g., ferrocolumbium, tungsten) in the 1920s that continued until 1991. Ferrocolumbium operations processed pyrochlore concentrates (i.e., natural ore) by exothermic reactions of pyrochlore with aluminum. The pyrochlore concentrates contained naturally-occurring thorium (1.87 to 2.08 percent) and uranium (0.04 to 0.06 percent) that remained in slag material following ferrocolumbium production (Reference e). Radiologically contaminated slags were retained on the plant site, along with a larger quantity of uncontaminated ferromolybdenum slags from the manufacture of molybdenum products. Both slags were used as landfill on the property. In 1972, some of the thoriated material from the site was disposed at the West Valley, New York, low-level radioactive waste burial facility. The licensee also preformed cleanup operations to segregate and stabilize some of the slag and soil onsite. Segregated material amounting to approximately 27,000 cubic meters was placed in a capped pile (slag pile) on the property south of Caldwell Avenue. A 2.44-m (8ft) steel security fence surrounds the area that is posted with radiation area signs.

3.0 RADIOLOGICAL STATUS OF THE FACILITY

3.1 Buildings

The licensee has classified the radiological status of buildings at the Washington site (Reference f and g). While the licensee has stated that the potential for significant contamination is low for all buildings, it has classified a number of buildings as “affected” to ensure that proper survey and cleanup procedures will be employed. Buildings were classified as “unaffected” if the prior history of use did not involve radiologically contaminated materials. This classification is consistent with the approach recommended in NUREG/CR-5849 (Reference h) for identifying potentially contaminated locations. To verify the radiological status, the licensee will conduct scoping surveys of unaffected buildings in areas where contamination, if present, would be most likely to exist. The scoping survey will consist of gamma and beta measurements at locations in the buildings determined by reference features inside the buildings. Readings will be recorded directly on equipment, structures, and the interior walls and floors of the buildings. This information will be used to support decontamination of building interiors prior to the final radiological survey.

Specific buildings classified as affected include the following: buildings 1, 19, 26, 29, 31, and 33. These buildings were used to store contaminated soil samples or other material from the site (e.g., buildings 1, 19, 31, and 33), store drums of pond residues (e.g., building 26) or support ferrocolumbium production operations (building 29). Building 1 was a laboratory that was used to store soil samples and conduct bench-scale thorium separation tests on slag.

All other buildings at the site are considered to be unaffected because they were not involved in ferrocolumbium production or storage of radioactive material. The licensee has stated that all unaffected buildings will undergo a scoping survey to verify the designated radiological status. This survey will consist of limited scan surveys and direct measurements in biased areas such as high traffic areas or selected horizontal surfaces. Measurements exceeding the instrument minimum detectable activity (MDA) will be investigated with an expanded scoping survey. If the average activity level for the direct measurements exceeds 10 percent of the thorium surface contamination unrestricted release limit or an individual measurement exceeds 25 percent of the limit, the building will be classified as affected.

3.2 Structures and Equipment

Most equipment on the site was not used for ferrocolumbium (i.e., licensed) operations, but this equipment has not yet been characterized for radiological contamination. To confirm the radiological status of equipment on the site, MolyCorp, Inc. will conduct a comprehensive inventory to identify each piece or type of equipment, document its use and operational history, and categorize it according to contamination potential. Equipment not used for processing licensed material and located in an unaffected building will not be surveyed. Equipment not used for processing licensed material, yet located in an affected building, will undergo a limited scoping survey to ensure residual contamination does not exceed unrestricted release limits. Any equipment used for processing licensed material will receive an unrestricted release survey prior to removal from the site. The location and radiation readings of interior walls, equipment, and structures surveyed within buildings will be recorded for categorization and to make results available for NRC inspection.

The NRC staff has found the characterization effort and decommissioning plan adequate for determining areas of elevated radioactivity on structures and equipment necessary for demonstrating compliance with unrestricted use criteria.

3.3 Radiological Status of Soils on the Washington Site

Radionuclide concentration and direct radiation levels for surface and subsurface soils at the MolyCorp, Inc., Washington facility have been measured at various times and locations using a variety of methods. A brief description of the surveys and key results follows.

In 1971, analysis of 21 samples collected by Applied Health Physics, Inc. (AHP) from a pile of slag indicated a maximum ^{232}Th concentration of 795 pCi/g (29.4 Bq/g), with radiation levels up to 1.2 mR/hr (0.31 C/kg per hr). AHP reported that ^{232}Th concentrations in the settling basins ranged from 218 to 327 pCi/g (12.1 Bq/g) (Reference j).

In 1972, AHP excavated an estimated 887,500 lbs of soil and thoriated slag and shipped it to Nuclear Fuel Services, Inc. in West Valley, New York (Reference j). The average thorium content of these shipped materials was reported to be 1.3% thorium. Direct gamma scans (1m)

were used to confirm that the soil/slag removal resulted in meeting a target contamination level for surface gamma readings of < 250 $\mu\text{R/hr}$ (64.5 nC/kg per hr).

In 1975, Molycorp, Inc., stored an additional 7646 m^3 (10,000 yd^3) of soil/slag on-site at the south end of the facility. This pile of slag was then covered with clean soil and re-vegetated (Reference k). Various estimates of the average and total thorium concentration in this slag pile and on the site grounds have been provided by Molycorp, Inc., (References e, l, and m). The most recent estimates suggest the pile contains 1064 pCi/g (39.4 Bq/g) average total thorium and a total of 14.7 Ci (544 GBq) total thorium and 7.34 Ci (272 GBq) total uranium (Reference h). Surface exposures at the slag pile were reported in 1975 to be < 250 $\mu\text{R/hr}$ (64.5 nC/kg per hr) (for comparison, background at the site is approximately 10 $\mu\text{R/hr}$ or 2.58 nC/kg per hr). The site is estimated to contain 23.9 Ci (884 GBq) of total thorium and 11.9 Ci (440 GBq) of total uranium (Reference g). Molycorp, Inc., stated this inventory includes subsurface contamination, the volume stored in the roll-off boxes, and the soil/slag pile.

In April 1985, an extensive radiological surface survey was conducted by Oak Ridge Associated Universities (Reference n). The survey included surface and 1 m scans and gamma-spectrometry analysis of soil samples for ^{232}Th , ^{228}Th , ^{238}U , and ^{226}Ra . A 20 m grid was used for the western third of the plant site and the entire south property. A 5 m grid system was used for an area near the northern property line with elevated radiation levels. Measurements and samples were also collected at 100 m intervals along the perimeter, 10 m intervals along the south-property perimeter near the soil/slag pile, 50 m intervals along rail lines, and 20 m intervals along Chartier's Creek. In addition, the same measurements and samples were collected from six off-site locations. Direct measurements were made with NaI(Tl) detectors and rate meters, while soil samples were analyzed using gamma spectroscopy. Above-background thorium levels were measured in dikes separating eight surface impoundments located west of the plant area. Surface activities were measured at or above background levels, indicating the potential for subsurface thoriated slag in the northwest portion on the site. The maximum ^{232}Th concentration at the plant site was 1380 pCi/g (51.1 Bq/g), while the maximum ^{232}Th concentration at the soil/slag pile was 1890 pCi/g (70.0 Bq/g). Off-site (i.e., background) measurements were typical for the region, with radionuclide concentration ranges for ^{232}Th of 1.00 to 2.05 pCi/g (0.037 to 0.076 Bq/g), ^{228}Th of 0.95 to 1.71 pCi/g (0.035 to 0.063 Bq/g), ^{238}U of 0.77 to 2.03 pCi/g (0.028 to 0.075 Bq/g), and ^{226}Ra of 0.89 to 1.19 pCi/g (0.033 to 0.044 Bq/g). ^{232}Th concentrations along the plant site's northern and western boundaries and the south property's eastern and southern boundaries exceeded 10 pCi/g (0.37 Bq/g). Because the characterization terminates at the facility boundary and therefore, does not provide any information to confirm that contamination has not migrated beyond the fence line, Molycorp, Inc., has agreed to conduct scan surveys beyond the fence line prior to and following excavation.

In 1990, RSA, Inc. conducted a subsurface survey across the western portion of the site and areas immediately to the north, west, and northwest of the impoundment area (Reference o). The survey included down-hole analysis in thirty-two new boreholes, plus in existing monitoring wells at the site. In addition, a surface survey was conducted with 400 measurements using a scintillometer. RSA, Inc. reported that about 70,463 m^3 (92,163 yd^3) of soil/slag remained at the site with concentrations > 10 pCi/g (0.37 Bq/g) and 31,452 m^3 (41,138 yd^3) remained at the site with concentrations between 5 and 10 pCi/g (0.18 and 0.37 Bq/g).

In 1995, a remediation action took place where eight impoundments located east of Chartier's Creek and west of the plant area were drained. Thoriated slag was found in two of the drained impoundments. The sludge from these two impoundments was placed into 8, 15.3 m³ (20 yd³) lined and covered roll-off boxes. Including the material stored in roll-off boxes and the slag pile, the total expected volume of material to be excavated is approximately 80,278 m³ (105,000 yd³) (Reference f).

In 1995, the site characterization report discussed survey results of 12,499 measurements collected from 418 boreholes. Two methods were used to delineate the subsurface distribution of thoriated slag/soil. The first method was down-hole gamma logging (NaI) at 6-inch intervals and was conducted in all boreholes, with count rates being converted to a ²³²Th concentration. The second method was gamma spectroscopy of borehole soil samples. Gamma-ray spectroscopy was used for about 20% of the boreholes at 6-inch intervals. In addition, four off-site boreholes, two west of the site and two east of the site, were analyzed to quantify natural background conditions. It was reported that over 99,109 m³ (3.5 × 10⁶ ft³) of soil/slag with ²³²Th concentrations > 5 pCi/g (0.18 Bq/g) remained at the site. Most of the soils with ²³²Th concentrations > 10 pCi/g (0.37 Bq/g) were reported to be near the surface.

In 1996, another remediation action took place at the Findlay property adjacent to the northern plant property line. During this action, 184, 15.3 m³ (20 yd³) lined and covered roll-off boxes of thoriated soil/slag were excavated and remain in storage on site awaiting final disposition at an NRC-approved location in accordance with the proposed decommissioning actions.

In 1998, an inspection of the Molycorp, Inc., Washington facility by the NRC Region I office included a limited radiological survey. A radiological survey of the soil/slag pile, various buildings, the impoundment area, and roll-off boxes was conducted using a Ludlum 19 survey meter. The reported exposure rates were 50 to 500 µR/hr (13 to 130 nC/kg per hr) for the soil/slag pile, 5 to 20 µR/hr (1.2 to 5.2 nC/kg per hr) for the moly building, 10 to 50 µR/hr (13 nC/kg per hr) for the impoundment area, and 5 to 15 µR/hr (1.2 to 3.9 nC/kg per hr) for the roll-off boxes (Reference n). For comparison, background exposure rates in the facility area are approximately 10 µR/hr (13 nC/kg per hr).

This data suggest inclusion of uranium in characterization studies and the final survey is a reasonable course of action to ensure compliance with the unrestricted release limits for soil (Table 1.3A).

Molycorp, Inc., soil characterization activities to date have focused on measurement of thorium and its daughter products, however, site characterization results suggest uranium is present at some locations in greater quantities than expected. For example, 184 samples analyzed as part of the Findlay cleanup yield a uranium to thorium ratio of 1.22 (Reference n). Similarly, samples of the impoundment material (U:Th of 0.549 (Reference n)) and the soil/slag pile (U:Th of 0.156) show orders of magnitude more uranium than assumed to be in the source ore (Reference e). To ensure compliance with unrestricted release limits, Molycorp, Inc., will develop and submit for NRC review and approval, a final survey plan that describes methods appropriate for determining the uranium concentration and demonstrating compliance with unrestricted release criteria for uranium and thorium taking into account the sum of fractions rule.

Because Molycorp, Inc., has planned to include uranium in the final survey plan and in compliance demonstration with cleanup limits, the NRC staff is confident that Molycorp, Inc., can safely remediate the site without extensive pre-excavation characterization of uranium concentrations. If the final survey detects uranium in excess of the unrestricted release limits, remediation and final surveys will continue until the unrestricted release limits are satisfied. Based on this information, the NRC staff find the characterization effort and decommissioning plan adequate for determining areas of elevated radioactivity in soils that require remediation to limit concentrations to the NRC limits for unrestricted release.

3.4 Radiological Status of Surface Water, Sediments and Ground Water at the Washington Site

3.4.1 Surface Water and Sediments

Radiological analyses of surface water and sediment samples from the site were reported by Foster Wheeler Environmental Corporation (Reference e) and by ICF Kaiser (Reference j). Key aspects of these studies are described in the following paragraphs.

In 1994, initial samples of surface water and sediments were collected during site characterization work. Surface water and sediments were sampled for uranium, radium and thorium at upstream and downstream sections of Chartiers Creek. Stream flow measurements were taken at the time of sampling. Only ^{228}Ra was detected in surface water samples with concentrations ranging between 5 to 6 pCi/L (190 to 220 Bq/m³) at the upstream section, while a concentration of 3 pCi/L (110 Bq/m³) has been detected in the downstream area. These results suggest a possible source of ^{228}Ra outside the facility grounds or perhaps measurement error. While on most reported levels are low, the highest radium concentrations are notable because they exceed the EPA 5 pCi/L (185 Bq/m³) radium drinking water standard. Sampling of groundwater in monitoring wells adjacent to the creek showed similar levels of ^{228}Ra .

Additional surface water samples were collected in 1997 following completion of site characterization (Reference j). Samples were collected for up and downstream locations on Sugar Run, Chartier Creek, and a ponded area in the northern end of the Hill Area. Samples were analyzed for thorium, radium, and uranium. Radiological analyses of the samples yielded a presence of ^{228}Ra at less than 1 pCi/L (37 Bq/m³) in the upstream locations on both Chartiers Creek and Sugar Run, while the downstream locations were below detection limits (Reference k). The other radioactive isotopes ^{234}U , ^{238}U , and ^{226}Ra were above the detection limit yet less than 0.5 pCi/L (18 Bq/m³) at either locations. The pond samples showed a slightly higher value of ^{228}Ra at less than 1.5 pCi/L (56 Bq/m³), ^{238}U at 2.38 ± 0.37 pCi/L (88.1 ± 13.7 Bq/m³), and ^{234}U at 2.70 ± 0.41 pCi/L (100 ± 15.2 Bq/m³). These results indicate a reduction in contaminant levels since 1994 to levels that are not considered to pose a threat to health and safety.

In 1994, stream sediments and stream bank materials were sampled for ^{232}Th at seven locations along Chartiers Creek. Four samples were obtained at each location covering both sides of the stream bank and two samples from the first six inches of sediments across the stream section. Concentrations of ^{232}Th from the stream samples ranged from 0.23 to 0.89 pCi/L (8.51 to 32.9 Bq/m³) suggesting no significant site-related impacts (Reference k).

Additional sediment samples were collected in Sugar Run, Chartiers Creek, and from the ponded area located at the northern portion of the Hill Area. Sediment samples were collected from the middle of the channel and analyzed for thorium, radium, and uranium. The results showed radionuclide concentrations less than 1 pCi/L (37 Bq/m³) for both upstream and downstream locations on both Sugar Run and Chartiers Creek. The pond samples showed similar results (about 1 pCi/L or 37 Bq/m³ for uranium, thorium, radium) (Reference j).

While NRC staff expects that the MolyCorp, Inc., planned soil remediation will reduce the primary source of contamination for surface water and sediments and thereby decrease future concentrations, more information is needed before a final conclusion can be drawn that a downward trend in contaminant concentrations can be expected. This is primarily due to the levels of contaminants reported in the first set of surface water measurements. Additionally, the small number of sampling times for both surface water and sediments are insufficient to establish trends over time. Sedimentation is also a concern during excavation due to the proximity of the excavated areas to the creek. To address these concerns, MolyCorp, Inc., has agreed to supplement its surface water/sediments monitoring program with additional radiological characterization efforts to establish current concentrations of the radionuclides of concern. The characterization activities will provide additional data by which trends can be assessed for prior sampling locations and aid the determination of whether surface water has been adversely impacted. Analysis of the new characterization results will help NRC staff determine if additional actions (e.g., remediation) are needed to mitigate impacts. As a result of this addition to planned decommissioning activities, NRC staff concludes that the plan is acceptable for ensuring potential impacts to surface water will be adequately characterized and addressed prior to license termination.

3.4.2 Groundwater

Radiological analyses of groundwater samples from the site were reported by Foster Wheeler Environmental Corporation (Reference e) and by ICF Kaiser (Reference j). A summary of key aspects of these studies are described in the following paragraphs.

Groundwater sampling was conducted twice between June 28 and July 12, 1994, (Round 1) and July 26 and August 3, 1994 (Round 2) from over 30 monitoring wells during site characterization. The samples were subjected to radiological analyses for thorium, radium, and uranium. Only one well (BR1) penetrated the bedrock for sampling. The other wells sampled groundwater from the overburden including the fill material, clay, and mixed alluvium. Analyses of groundwater on site show radiation levels are generally low in samples obtained from the overburden, however, the maximum concentrations of ²²⁸Ra reported for a few wells exceed the EPA drinking water limit of 5 pCi/L (185 Bq/m³) (e.g., 5.32 ± 2.20 pCi/L or 197 ± 81.4 Bq/m³ in MW21, 5.16 ± 3.55 pCi/L or 191 ± 131 Bq/m³ in MW26). This data suggest additional sampling is needed to improve concentration estimates and establish the trend in the groundwater concentrations.

Radioactivity is close to detection limits in the one sample from the bedrock unit. The availability of only one groundwater sample in the bedrock unit (BR1) is insufficient to characterize the radiological status of the unit. The spatial variability of the fill, clay and mixed sediments make it difficult to limit the possibility that contamination could be at higher levels at different locations than the one sampled. The bedrock well is reported to have elevated levels of molybdenum (Reference e) which indicates hydrologic communication between the water in

the bedrock unit and surface soils of the facility. The soils contain molybdenum from past Molycorp, Inc., operations unrelated to licensed operations. Site characterization hydrologic data reported by Foster Wheeler Environmental Corporation (Reference e) support a conclusion that there is hydrologic communication between the overburden and bedrock units (see Section 2.4.4).

From review of the available data, NRC staff concludes that the characterization of groundwater at the Washington site by Molycorp, Inc., shows radiological contamination for one sample exceeds current EPA drinking water standards (proposed standards were considered as a guideline for uranium, which currently has no limit). Drinking water standards were considered appropriate because site characterization information did not rule out potential future use of groundwater as a drinking source although indications are that this is unlikely. NRC staff also expects that the Molycorp, Inc., planned soil remediation will reduce the primary source of contamination for groundwater and thereby decrease future concentrations. Nonetheless, the levels of radium in some samples suggest the need for additional monitoring to establish a decreasing trend. The extent of excavation activities and shallow depth of the water table also present concerns for potential mobilization of contaminants. To address these concerns, Molycorp, Inc., has agreed to submit a supplemental groundwater characterization and monitoring plan to NRC for review and approval prior to commencement of decommissioning activities. This plan will focus on the following information needs: (i) greater coverage of radiological conditions in the bedrock unit to the west of the site boundary (the direction of groundwater flow) to assess whether offsite migration has occurred; (ii) more recent estimates of radionuclide concentrations before and after excavation; and (iii) improved temporal data to assess trends in key radiological contaminants. The plan will also include proposed measures to control contaminant migration and identification of water management activities for excavation of soils in the saturated zone. Analysis of the new characterization results prior to license termination will help NRC staff determine if additional actions (e.g., remediation) are needed to mitigate impacts. As a result of this addition to planned decommissioning activities, NRC staff concludes that the plan is acceptable for addressing potential adverse impacts to groundwater prior to and following the start of decommissioning activities.

4.0 TASK MANAGEMENT, PROJECT ORGANIZATION AND TRAINING

The process of decontaminating buildings, cleaning and releasing equipment and structures, and excavating contaminated soil at the Washington site is part of the decommissioning activities described in the "Washington Pennsylvania Facility Decommissioning Plan" and its associated references. The Molycorp Project Manager will function as the Molycorp, Inc. representative for the decommissioning project and will provide oversight for all project activities. The Molycorp Project Manager will coordinate cost and schedule reporting requirements with the Contractor. The Site Health and Safety/Radiation Safety Officer (RSO) reports to the Site Manager (responsible for the daily activities on the project) during daily activities. The RSO will receive directions from the Corporate Health Physicist. NRC staff has examined the RSO position with regard to the organization structure presented for the proposed decommissioning project and has concluded through discussions with the licensee (telecon of July 13, 2000, from Roy Person, NRC to Dave Fauver, RSA) that the RSO will have the authority necessary to perform its functions (e.g., to prevent the performance of work activities that might jeopardize the safety of personnel, violate approval plans, procedures, or practices that could result in the unwarranted release of contamination).

This project will employ a radiological engineer (RE) who will participate in project planning and reporting activities to ensure that regulatory compliance is achieved. The RE will also be responsible for the adequacy of plans and procedures and develop project specific plans and work instructions (radiation work permits) to assure that radiological safety is maintained in the execution of decommissioning activities. An important function of the RE will be to ensure that radiation exposure to personnel are maintained as low as reasonably achievable (ALARA) and to ensure that radiation levels are always within regulatory limits.

The licensee has agreed to conduct a training program that meets the requirements of 10 CFR 19.2, "Instructions to Workers." All contractor and subcontractor personnel working on site will be trained in this regard before participating in decommissioning activities. The RSO will maintain training records for all personnel working on site. Qualifications for both the RSO and the RE are discussed in Reference b. NRC staff has concluded that the proposed task management, project organization, and training for the proposed action are acceptable.

5.0 RADIATION PROTECTION PROGRAM

The licensee's radiation protection program (contained in Radiological Services, Inc.'s procedures) currently in effect for the Washington site will be implemented through revised procedures which provide radiological protection for activities during decommissioning. The purpose of the plan is to establish and maintain policies and procedures conducive to the safe handling of radioactive materials. The plan has also been developed to provide for health and safety in working with radioactive materials. Additionally, this plan has been developed to provide for the health and safety of members of the public while on the MolyCorp site. The plan addresses personnel radiological safety responsibilities, the ALARA program, personnel dosimetry, radiation protection training for workers, use of radiation work permits (RWPs), radiological contamination surveys, emergency procedures, and overall control of radioactive material. NRC considers this program, developed for emergency and normal operating conditions, to be acceptable during decommissioning of the Washington facility.

6.0 RECORD OF REGULATORY COMPLIANCE

Inspections of the Washington facility for the last five years revealed no items of noncompliance and overall, the NRC staff's examination of the licensee's compliance history indicates successful performance in working with radioactive materials and proper management of the decommissioning operation can be anticipated.

7.0 PHYSICAL SECURITY

Subpart I of Part 20 (section 20.1801), "Storage and Control of Licensed Material," requires that the licensee secure the facility from unauthorized removal or access the licensed materials that are stored in controlled or restricted areas. The decommissioning activities will be conducted in the controlled area inside the main fence that borders the site. This fence is locked to secure licensed material. When the fence is opened, a guard is present to provide surveillance of the licensed material. NRC staff considers this level of security adequate for the type of licensed material at the site.

8.0 SUMMARY AND CONCLUSION OF SAFETY EVALUATION

The safety evaluation for this proposed action has evaluated: (1) the radiological status of the facility; (2) the task management, organization, and training for the decommissioning operations; (3) the licensee's radiation protection program; (4) the licensee's record of compliance with NRC regulations; and (4) physical security for radioactive material during decommissioning operations. In addition, the radiological status of the buildings, equipment, soils, surface water, sediments and groundwater has been addressed. Based on this evaluation, NRC staff has determined that the licensee has provided an adequate program and basis for carrying out safe decommissioning operations and that the proposed action can be carried out in accordance with the NRC's regulations. In addition, as documented in the EA (Reference c), the proposed action will not result in a significant impact on the environment.

9.0 RECOMMENDATIONS

Based on the foregoing evaluation, NRC staff recommends that the amendment be approved with the following license conditions:

Pursuant to 10 CFR 20.1401(b) and 40.42(g)(5), the licensee is authorized to decommission those portions of its facility currently contaminated with radioactive material in accordance with the unrestricted release criteria approved by the Commission in the Site Decommissioning Management Plan Action Plan of April 6, 1992, (57 FR 13389). Except as specifically provided otherwise in this license, the licensee shall conduct its decommissioning in accordance with the statements, representations, and procedures contained in: (1) the license application and decommissioning plan dated June 30, 1999; (2)

The NRC's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive.

- A. Prior to excavation of contamination, Molycorp, Inc., shall submit to NRC for review and approval a supplemental characterization and monitoring plan for groundwater, surface water, and sediments. The plan will provide the following information:
 - 1. Radiological characterization of the bedrock unit near the western boundary of the site prior to and after excavation, sufficient to provide evidence that contamination is not migrating off site in the bedrock unit;
 - 2. Updated groundwater, surface water, and sediment monitoring data from previously sampled locations prior to and after excavation, sufficient to establish radiological trends for thorium and uranium and their significant daughter products and to provide assurance that post excavation contamination levels are within acceptable limits and;
 - 3. The planned extent of excavation below the water table and control measures (e.g., engineering controls, waste water management plans, and contamination controls) that will be used to limit migration of contamination. Similar information shall be provided for non-radiological contamination if such contamination is mixed with the radiological contaminants.

B. Prior to excavation of contamination, MolyCorp, Inc., submit a detailed supplemental characterization plan for NRC review and approval. The supplemental characterization plan should include information from site surveys that establish the equilibrium status of uranium-238, thorium-232, and their daughter products at the Washington site. In the event a total uranium/thorium ratio approach is proposed for estimating total uranium concentrations for demonstrating compliance with the unrestricted release criteria, then the survey plan must include the following:

1. Site-specific information that supports the uranium to thorium ratio;
2. Survey results that demonstrate the U:Th ratios across the site are reasonably homogenous or the applicability of all U:Th ratios to specific survey locations across the site; and
3. Detailed information on survey protocols, instrumentation, and proposed analysis methodologies (e.g., statistics, inferences, and application of sum-of-ratios rule) for survey results that will be necessary to demonstrate compliance with unrestricted release criteria.

If MolyCorp, Inc. cannot justify the application of a U:Th ratio approach, then appropriate laboratory techniques should be used to measure uranium concentration in soils directly.

- C. MolyCorp, Inc. shall ensure that any soils designated as affected that exist underneath buildings and structures will be subject to the same remediation and final survey methods used for affected open land areas;
- D. Prior to conducting any approved decommissioning operations on the Washington site, MolyCorp, Inc. shall submit to NRC for review and approval a final set of radiation protection procedures that address compliance with all applicable 10 CFR Part 20 requirements for protection of workers and the public from potential radiological hazards resulting from those decommissioning activities;
- E. One week prior to beginning excavation, MolyCorp shall inform the U.S. Nuclear Regulatory Commission Region I (King Of Prussia Office) and the Division of Waste Management; and
- F. MolyCorp is authorized to transfer low-level radioactive waste offsite for disposal at a licensed low-level radioactive waste disposal facility. On site disposal is not authorized by this amendment.

10.0 REFERENCES

- a. MolyCorp, Inc., "Decommissioning Plan for the Washington, PA Facility" Foster Wheeler Corporation, July, 1995.
- b. U.S. Nuclear Regulatory Commission, "Action Plan to Ensure Timely Cleanup of Site Decommissioning Management Plan Sites," 57 FR 13389, April 16, 1992.

- c. U.S. Nuclear Regulatory Commission, "Environmental Assessment of the Proposed Decommissioning Plan for the Molyocorp, Inc., Facility in Washington, PA," July, 2000.
- d. Radiological Services, Inc., "Washington, PA Facility Decommissioning Plan, Part 1 Revision," June 30, 1999.
- e. Foster Wheeler Environmental Corporation, Site Characterization Report for License Termination of the Washington, Pennsylvania Facility, Volumes 1-3, Perryville, NJ: Foster Wheeler Environmental Corporation, January, 1995.
- f. Dawes, G.W., Molycorp, Inc., Letter to L. Camper, Nuclear Regulatory Commission, April 3, 2000a.
- g. Dawes, G.W., Molycorp, Inc., Letter to L. Person, Nuclear Regulatory Commission, May 16, 2000b.
- h. U.S. Nuclear Regulatory Commission, "Manual for Conducting Radiological Surveys in Support of License Termination," Berger, J.D. et. Al., "NUREG/CR-5949, 1992.
- i. Applied Heath Physics, Inc., "Summary of Actions Taken During 1972-1974 to comply with Requirements of the Nuclear Regulatory Commission," Bethel Park, PA, 1975.
- j. ICF Kaiser, Washington Facility Environmental Report, Volumes 1 and 2, 67861-04c, Pittsburgh, PA, April 1997.
- k. Felmy, A.R., R. Dhanpat, and V.L. Le Gore, "Solubility and Leaching Controls on Radionuclides in SDMP Wastes: Summary Report (draft)," Richland, WA: Pacific Northwest Laboratory, 1998.
- l. Martin, K.L., "Radiological Survey of Molybdenum Corporation of America, Washington, Pennsylvania," Oak Ridge, TN, Oak Ridge Associated Universities, 1985.
- m. Bellamy, R.R., U.S. Nuclear Regulatory Commission Letter to R. Dankmeyer, Molycorp, Inc., Inspection Report of Inspection of the Molycorp. Inc., Washington Facility, October 8, 1998.
- n. Daniels, J.C., Letter to L.S. Person, Nuclear Regulatory Commission, Washington, PA: Molycorp, Inc., January 28, 1997.
- o. Wrenn, M.E., "A Sub-surface Survey for Thorium Content at the Molycorp Plant Site in Washington, PA., Salt Lake City, Utah: Radiation Surveillance Associates, Inc., December 27, 1990.